

Summary of adaptation capacity building recommendations from the October 4 focus groups sessions (Version 4, 12/3/12)

****This version notes several comments from SLRAC members and includes additional recommendations that have been proposed for inclusion since the 11/2/12 SLRAC meeting***

****This version ALSO contains text and suggestions from the Survey and subsequent follow ups.***

On October 4, 2012, six focus groups met at St. Jones Reserve to develop the following sea level rise adaptation capacity building recommendations. Focus groups were comprised of experts broken out based on the main groupings of the resources addressed in the Sea Level Rise Vulnerability Assessment: Coastal Defenses, Industrial Land Use, Land Use, Land Preservation and Habitat, Transportation, and Water and Wastewater.

To ease the review of the recommendations developed, DCMP was able to discern eight primary areas of overlap to divide the similar recommendations into. Several of the adaptation capacity builders that were discussed had been addressed in more than one of the focus groups. To depict this overlap, each recommendation indicates which group, or groups, brought up that recommendation in their session(s). Additionally, to weigh the importance of the many recommendations developed, at the end of each focus group members of that group indicated their top three recommendations based on immediate needed, ability to accomplish the goal or spirit of the recommendation, and/or the importance of the recommendation. These rankings are indicated by asterisks following the recommendations synthesized below.

Improve Communication and Coordination between State, Federal, Local and Regional Partners to Streamline Sea Level Rise Adaptation Efforts

- 1. Inventory existing funding, coordination, regulations and policies for barriers and opportunities (Industrial):** *Developing a list of these mechanisms will provide a starting place to assess coordination and understand where improvements can be made. Some of these existing tools, funding mechanisms and regulations have already been compiled. Incorporated into this inventory can be an understanding of private sector contingency plans that incorporate sea level rise.*
 - a. Survey Comments**
 - i. Could spend a tremendous amount of time/effort on this! (need to target)
 - ii. For the purpose of removing regulatory obstacles to replacement of impacted buildings & zonings.
 - iii. Regulatory drivers and funding are most important
- 2. Coordinate with Maryland Department of Transportation (Transportation):** *Delaware and Maryland have an integrated road system that requires coordination between both states to*

adequately address sea level rise. Maryland is addressing sea level rise in a different way than Delaware is, and working closely with them and understanding how they are developing or changing their long range plans can provide guidance for Delaware's own plans. Specifically, Delaware can look at how Maryland is handling waterfront development and understand how they plan to continue to develop routes to beach communities, in both DE and MD, and push tourism to the these communities. MAP21 may be instrumental in looking at evacuation coordination.

a. Survey Comments

- i. Only at state lines. Maryland has no business playing any official role in Delaware government.
- ii. This should include sharing of technology and innovations related to building roads and bridges in these environments such as least cost methods to elevate roadways across compressible soils, multi-modal solutions to providing transportation access, development of hydrodynamic coastal modeling for bridge openings and deck elevations, etc.
- iii. As I was unable to attend the meeting, I'm not sure what this recommendation is in regards to and why Maryland was specifically identified

3. Develop a Federal Highways Administration (FHWA) Climate Change Framework

(Transportation) *The FHWA has developed a multi-mode approach addressing climate change. Applying this multi-mode approach across DelDOT can increase the ability for coordination between Maryland and Delaware to better address sea level rise.*

a. Survey Comments

- i. I only disagree because I don't think the discussion on this topic was captured accurately in the draft adaptive capacity recommendations. I think the discussion at the workshop centered on having FHWA provide leadership in bringing the coastal state DOTs together to set design policy, develop coastal infrastructure management strategies, and define funding eligibility. This could be a task force style committee or a conference on the topic.
- ii. why would a state develop a federal framework?
- iii. I don't know what a "multi-mode approach" means. More explanation is needed.

4. Improve Coordination of permit decisions at the Federal, state and local level (Industrial)

There are often problems with permitting agencies not being on the same page and lacking common goals. It may be helpful to have sea level rise incorporated into the active permitting process.

a. Survey Comments

- i. Only if it leads to more rapid issuance
- ii. I agree with this and think the adaptation plan needs to include a thorough review of the state and federal regulations that typically cover infrastructure repair and replacement. Most of the current regs (including FEMA disaster relief) only allow and/or fund in-kind replacement, which essentially guarantees another disaster. When infrastructure fails due to extreme weather events and

sea level rise, the repairs or replacements need to be engineered and constructed to new standards to account for the extreme weather events and sea level rise predicted to occur during the anticipated design life of the structure. The permitting and funding of those structures so designed needs to be as simple and straight-forward as an in-kind replacement is currently.

- 5. Incorporate sea level rise into regional planning efforts (Industrial)** *Industrial facilities in DE are dependent upon electrical infrastructure in neighboring states (substations, transmission lines, distribution). Therefore, it will be important to incorporate regional interests in adaptive responses. Perhaps this can be considered in regional planning bodies like the mid-Atlantic Council on the Ocean (MARCO).*

a. Survey Comments

- i. terribly important
- ii. No, because inevitably it will lead to vetoes by bureaucrats
- iii. Seek clear authority from the General Assembly for land-use planning and regulation for SLR response. This authority should trump local or county planning and zoning authority and should be established in such a way as to minimize the potential for “takings” claims against the State. Given past experience with State land-use planning, this is likely to be very controversial, especially in Sussex County.
- iv. I asked my Utilities Section at DelDOT to reach out to Delmarva Power to see if there is an industry coalition for electric power generators and transmission companies. I'll let you know what we find.
- v. Absolutely 100% agree with this recommendation

- 6. Leverage resources for research and development of shoreline stabilization techniques and sediment management techniques through regional, state and federal partnerships (Land Use and Preservation)** *New and innovative solutions may exist such as certain shoreline stabilization methods, wave attenuation structures or oyster reefs, offshore structures to direct depositional zones to sediment starved areas, etc. Pilot projects to determine the efficacy of untested techniques may yield positive results. Forming or strengthening partnerships with neighboring states, federal agencies, universities, and non-profits will greatly expand the knowledge and funding available for research and development. Collaboration can expand regional sediment management research and opportunities for beneficial reuse of dredged spoil.*

a. Survey Comments

- i. If done in the right spirit
- ii. This is bureaucratese which will not be readily understood by the general public.
- iii. I think this should include ocean engineering techniques and strategies
- iv. Nonprofit organizations should be included here
- v. I strongly agree with green solutions being at least part of the plan; Nature is presenting the challenge and Nature holds the solution.

- 7. Coordinate future land purchases and preservation opportunities with the with Open Space Council and Agricultural Land Preservation Program (Land Use)** *Land preservation in the state is guided in part by these two councils, each having criteria that they use to purchase or preserve*

land through easements. Incorporating sea level rise considerations into the decision-making criteria may help ensure sustainability of future land purchases. The Open Space Council has already incorporated a sea level rise criteria into their ranking scheme.

- a. **Comment rec'd to ensure that this recommendation does not infer that funds allocated to the Ag Preservation Programs be combined with the Open Space program and re-allocated to preserve farmland adjacent to wetlands.**

b. Survey Comments

- i. ...if the coordination efforts are done within a sea level rise planning framework. This is implied in the long version of the recommendation.
- ii. After 4 years of financial crisis with no end in sight, the state shouldn't be buying open space.
- iii. I question whether this is would be an appropriate expenditure. It seems like Ag land funds should be spent to preserve land that will always be Ag land. Spending this money on land that is likely to flood seems strange to me in the context of land preservation. While purchasing land may be the best way to control land use, spending tax dollars on what may be sacrificial land seems like throwing money away. On the other hand it could potentially save the area from development that will be far more expensive to deal with when the inevitable occurs. This one just isn't clear to me as a good adaptation strategy.
- iv. The way that the Agland preservation law is written does not allow for this type of priority discussion. I would remove them from this recommendation but keep the open space program.

- 8. Develop a Sea Level Rise Group within American Association of State Highway Transportation Officials (AASHTO) (Transportation)** *AASHTO is a national group that has DOT representatives from all states. There is a mid-Atlantic group that could include a sea level rise sub group to meet and gather information on how the other mid-Atlantic regions are addressing sea level rise in their long range planning. This group may also provide the opportunity to coordinate with adjacent states.*

a. Survey Comments

- i. Will be just another bunch of nay sayers
- ii. Again, not sure how the state can develop or create anything in a regional/national body. We can certainly make recommendations but our power is limited.

Provide increased regulatory flexibility for adaptation and improve consistency between regulatory agency decisions

- 1. Create a "Coastal Road" designation (Transportation)** *Designate roads in areas that are to be affected by sea level rise as coastal roads. Designating these roads would change the amount of maintenance required for each of these roads, possibly leading to the eventual abandonment of*

a road. New roads that may acquire this designation should include some type of consideration for avoidance of areas based on regulation due to the likelihood for flooding and inundation in that area.

a. Survey Comments

- i. Construction of new highways, roads, and bridges should, where feasible, be located outside of areas at risk for flooding/inundation within the life span of the project (i.e., if a road is expected to last 50 years, it should not be constructed in an area that will be inundated in less than 50 years, unless it is elevated above the expected inundation level). This should be implemented in the planning process as soon as feasible. Repairs to existing roads should take the likely date of future inundation into account. If existing roads are to be abandoned due to SLR issues, they should be deconstructed, the remains removed, and the land used for protection of natural resources, e.g., for buffer zones into which wetlands could migrate, or conversion to inundation-tolerant forests or agriculture.
- ii. We discussed this at the workshop in the context that this had been proposed by some people, and it may work for a few roads, but there are practical reasons why we cannot wholesale change all the roadways' "classifications" ("designation" is not the term used in FHWA parlance). The practical reasons come down to the volume of traffic and other route options that may not exist. Just as it would be impossible to direct the Mississippi River through a small pipe, it would be impossible to direct a large volume of traffic down a narrow clam shell street. Roadway lane widths, the number of lanes, and the type of surface are dependent on the number of vehicles that use the road.
- iii. what does this provide exactly?

2. **Allow Conceptual design planning for sea level rise to expedite permit process.

(Transportation) Permitting for DelDOT projects requiring new permits can be a time consuming process that does not readily allow for sea level rise adaptation opportunities. Replacement and maintenance of roads in-kind is relatively quick to permit, if the funds are there, and the associated impacts are minimal since the review and permitting process does not require a NEPA review when work is done within the existing ROW. To expedite the process, DelDOT can identify priority projects that may need new permits based on the road and bridge data (outlined in the data needs recommendation) along with the established sea level rise equations and the inundation models from the sea level rise vulnerability assessment. Conceptual plans can be presented at DelDOT's quarterly interagency meetings to gather input and address any federal and state concerns that may arise when the final application package is submitted to the individual agencies for review and permitting. Involving the agencies in the initial design phases increases their understanding of, and input to, the purpose and need as well as the avoidance and minimization of individual projects. Increasing involvement in pre-application planning can expedite the review and permitting process for the final plans; making it more cost and time effective for when the need to issue the permit for the specific project arises.

a. Survey Comments

- i. The write up in the draft adaptive capacity recommendations needs to be cleaned up considerably. I understand how difficult it is to capture a discussion with multiple people speaking about arcane topics. I'm amazed at how much you actually did capture, but there are several parts that just miss the point. I think the salient point is that we need to get buy-in from resource agencies to expedite permit approvals for infrastructure adaptation. This may require regulatory changes. DelDOT and our fellow DOTs across the country are struggling with the current NEPA process as it is project centered and climate change is a global phenomenon. We need statewide and regionwide strategies to deal with it. Until we have broad planning goals and strategies in place, it will be difficult to address climate change issues in project level NEPA documents. The lack of that guidance will slow our progress toward adaptation.
 - ii. needs to be rewritten to make its meaning clear
- 3. ****Allow connection of individual septic systems to community systems with excess capacity (Water & Wastewater)** *Community systems, private treatment facilities, and satellite treatment facilities with excess capacity could be tapped into to connect nearby failing systems. This would allow systems failing due to sea level rise to connect to closest available capacity as an interim measure. Concurrently, there would be the need to restrict further development in areas vulnerable to sea level rise.*
 - a. **Survey Comments**
 - i. May foster additional development in non-ideal locations
 - ii. Who pays?
 - iii. A funding source will be required due to the costs of extending long lines to individual remote area. A requirement to connect will be necessary to enable this to be implemented, once an area is declared as unable to get a replacement septic system
- 4. ****Promote local land use ordinances that discourage the siting of infrastructure in potential inundation areas without considering the effects of sea level rise (Water & Wastewater)** *Land use in Delaware is primarily controlled at the local level. Regulations governing land use relating to Sea Level Rise should be consistent between the State and local governments. Allowances need to be made for adaptation responses while limiting any expansion.*
 - a. **Survey Comments**
 - i. should read, "Promote local land use ordinances that discourage the siting of ANYTHING OTHER THAN INFRASTRUCTURE FOR RECREATIONAL OR AGRICULTURAL ACTIVITIES in potential inundation areas...."
 - ii. Awkwardly phrased.
- 5. **Consider sea level rise implications in future regulatory updates of wastewater systems and wells (Water and Wastewater)** *Sea level rise and its associated impacts- increased flooding, rising water table, salt water intrusion- can reduce or eliminate the functionality of on-site wastewater treatment systems and groundwater wells. Permit criteria for the siting, design and construction of disposal systems and wells are specified in regulations. Incorporating sea level*

rise considerations into future updates of these regulations to implement protective design and siting requirements could reduce vulnerability of these systems and wells.

a. Survey Comments

- i. If added requirements are imposed on systems that are meant to function well for decades, while speculating for possible future negative impacts, it could add great costs for the short/near term with no proven value.

- 6. Inventory existing funding, coordination, regulations and policy for barriers and opportunities (Industrial)** *Developing a list of these mechanisms will provide a starting place to assess coordination and understand where improvements can be made. Some of these existing tools, funding mechanisms and regulations have already been compiled. Incorporated into this inventory can be an understanding of private sector contingency plans that incorporate sea level rise.*

a. Survey Comments

- i. this is really a primary activity
- ii. not sure what is meant here

- 7. Ensure that state regulations are not contradictory or at cross purposes (Industrial)** *Strategic plans at the local, state and federal level should all be based on common goals. Adaptive responses will be difficult if these plans contradict each other. For example, choosing to protect property, or vacate it must be consistent across these levels of government.*

a. Survey Comments

- i. Make sure this doesn't become an ambiguous permit waiver
- ii. Establish a primacy of regulations - sometimes, contradiction reflects community values.
- iii. Do not let this process be used as an excuse to weaken environmental protections.

- 8. Sign an Executive order to direct agencies to plan and manage for sea level rise (Water & Wastewater)** *As regulations rotate through normal update cycles, sea level rise considerations should be written in, where appropriate. However, this will not happen without direction from the top. This would set State standard, in addition to existing Agency policies.*

a. Survey Comments

- i. Useless without funding to make it go.
- ii. I agree with Karl Kalbacher: EOs can be repealed at the whim of a (new) governor. Legislative action is more durable and therefore preferable.
- iii. Specificity will be required; certain agencies will have different interpretations than other ones.
- iv. And fund it!

- 9. **Improve political willingness to include sea level rise in decision making process (Coastal Hazards)** *To effectively include sea level rise in any program, sea level rise needs to become part of the governor's agenda. The decision making process will not include sea level rise until there is political support from the governor and other politicians pushing the matter through an executive order.*

a. Survey Comments

- i. **How?**
- ii. **See #8**

10. Incentivize regulations that encourage adaptation to sea level rise and allow innovative projects. (Industrial) *There needs to be a common goal among agencies towards sea level rise adaptation. It is currently difficult to protect shorelines or assets because of that lack of coordination. Along the same lines, there may need to be some willingness to compromise in some of the regulations, so that sea level rise adaptation can occur in a cost effective manner. If an industrial facility has to do a mitigation project for each barrier they put up, it may be difficult for them to adapt responsibly.*

a. Survey Comments

- i. Are we talking about wetland mitigation here? Should make sure this does not become a way to get out of mitigation requirements
- ii. VERY important
- iii. More bureaucratized. Potentially weakens environmental protections.
- iv. What is the "incentive"?

11. **Evaluate the state Coastal Zone Act for changes that would allow industry more flexibility to adapt to sea level rise. (Industrial) *Coastal Zone Act currently limits industrial facilities' abilities to move to new locations. If the state of Delaware decides to make heavy industry a priority it may be worth re-evaluating this act to improve options.*

a. Survey Comments

- i. This is dicey. "Flexibility" would probably mean "encroachment upon."
- ii. Must be done, but in a very, very deliberate and careful way.
- iii. Yet another in a long line of attempts to weaken the CZA. Potentially weakens environmental protections for the private benefit of industries.
- iv. As this is a law already on the books. I would discourage this recommendation/changes to the Act itself. Perhaps expanding for evaluating the regulations would be more appropriate.

12. Create legislation to address transfer of facilities in case of retreat: decrease number of abandoned assets, liability of assisting facilities (Industrial) *Sea level rise could eventually result in abandonment of industrial properties. In the past there have been financial assurance programs, but money is not always adequate. In the past there have been transfer legislation that dealt with bankruptcy, but the regulations were never developed to implement the program.*

a. Survey Comments

- i. Should allow uncontaminated properties to decline/be reclaimed naturally to encourage abandonment
- ii. Seek legislation transferring abandoned properties to the State, or at least giving the State a lien on them.
- iii. Seems very complicated

- iv. needs to be rewritten to make its meaning clear, especially the liability of assisting facilities.

13. Expand DNREC authority to acquire and/or protect areas identified as feasible and necessary for wetland migration (Land Preservation and habitat) *By expanding the ability of the Department of Natural Resources and Environmental Control to regulate tidal wetlands to include lands adjacent to those wetlands that may allow wetland migration, the state can protect areas that may become future wetlands, thus preserving some of the flood protection and habitat value of these systems.*

a. Survey Comments

- i. Not sure we can yet identify with great certainty areas "feasible and necessary" but should explore for potential in future
- ii. Is eminent domain an option?
- iii. DNREC already has this authority under 7 Del. C., Ch. 75, Delaware Land Protection Act. We just need the funding!
- iv. This is dangerous politically. Suppose the land never gets "wet"? What is the DNREC jurisdiction?
- v. Strongly agree

Provide consistent and predictable policies for future growth, investment, and natural resource management.

1. Incorporate sea level rise into the Strategies for State Spending and Policy and Comprehensive Development Plans (Land Use, Industrial, Land Preservation & Habitat) *From Land Use: This would allow coordination with local governments on sea level rise, and provide opportunity for education of municipal officials. Result would be Comprehensive Development Plans that consider sea level rise using the best available data. From Industrial: This recommendation focuses on ensuring sea level rise is included in comprehensive plans and state strategies for policy and funding. The local governments have the authority to develop comprehensive plans. Legislation may also be required, as it includes the required elements of comprehensive plans. Currently there is mention of flood plains, but more as a natural resource, not a potential sea level rise threat. Included in this discussion was a call for prioritization by the state, so that industry adaptation isn't so costly they lose incentive to do it. From Land Preservation & Habitat: This would allow coordination with local governments on sea level rise, and provide opportunity for education of municipal officials. Result would be Comprehensive Development Plans that consider Sea Level Rise using the best available data*

a. Survey Comments

- i. The State Strategies is advisory only, and though it might make people feel better about doing something, it can't legally require any concrete improvement in the situation. Developers actually take the Strategies pretty seriously though (more seriously than they're legally required to), and this could do some good.

- ii. This needs to be supported by legislation so DNREC doesn't get its butt handed to it in court again.

2. **Incorporate sea level rise into Delaware's Long Term Transportation Master Plan

(Transportation) *This plan has an executive summary that lays out broad policy statements outlining the direction DelDOT is planning to take in the state. There should be data backing up all of these statements substantiating traffic patterns, flows, etc. Including sea level rise in this evaluation, or as a particular statement in the plan, will help make DelDOT become more adaptable to sea level rise in the future.*

a. Survey Comments

- i. "In preparing for battle, I have always found that plans are useless but planning is indispensable." (Dwight D. Eisenhower) Not sure of the difference between 2 and 3. If existing roads are to be abandoned due to SLR issues, they should be deconstructed, the remains removed, and the land used for protection of natural resources, e.g., for buffer zones into which wetlands could migrate, or conversion to inundation-tolerant forests or agriculture. Could light rail, bicycle paths, or telecommuting (or water taxis and ferries) replace some portion of highway capacity or other transportation infrastructure at less overall cost?

3. Incorporate sea level rise into the Transportation Operations Management Plan (TOMP)

(Transportation) *Include sea level rise in this plan and use the sea level rise information included in TOMP to feed science into the Long Range Transportation Master Plan*

a. Survey Comments

- i. More focused on short-term threats, like storm surges, etc. Can be informed by SLR studies

4. **Include sea level rise in the transportation design manuals (Transportation) *Design manuals currently do not include sea level rise equations in the designs of roads and bridges.*

Incorporating these equations into the design manuals can help guide DelDOT in future repairs and maintenance projects needed for roads and bridges to mitigate for current and future effects from sea level rise.

a. Survey Comments

- i. National standards will need to be developed and adopted by AASHTO
- ii. A no-brainer

5. **Develop a Statewide Retreat Plan (Transportation, Land Use) *From Land Use: A statewide plan for retreat would put lifespan limits on infrastructure in vulnerable areas and communicate those limits to citizens. This would provide predictability for citizens and businesses and could also allow citizens to craft their own adaptation plan without state assistance*

From Transportation: Implement a coastal tax, classify some roads as "coastal roads," implement traffic metering, change the current capacity through increased use of transit, reduce the level of service to some roads over time, and discourage future development.

a. Survey Comments

- i. Very important.
 - ii. At least for public assets.
 - iii. This is necessary to prioritize State expenditures on benefiting the population as a whole before private interests come with their hands out.
 - iv. The details will be hotly debated well beyond what was discussed in the workshops, but strategic retreat will need to be a key component of any adaptation plan.
 - v. Premature to start putting traffic meters, etc. in place
- 6. **Conduct a legal review of Disinvestment and Abandonment (Land Use)** *Several of the capacity building strategies discussed at this focus group centered around themes of retreating from publically maintained infrastructure and issues that could arise should homeowners retreat and abandon their structures. Before policy decisions regarding these issues can be made, a comprehensive review of the local, state and federal legal framework will be necessary.*
 - a. **Survey Comments**
 - i. Crucial - and happening at DeIDOT.
 - ii. Seek legislation transferring abandoned properties to the State, or at least giving the State a lien on them.
- 7. **Consider use of a statewide Transfer of Development (TDR) tool (Land Use)** *A TDR helps to direct future growth away from vulnerable areas by allowing for increased densities elsewhere. This could help to ensure future growth needs are met, but by utilizing land outside of potentially vulnerable areas. There was much discussion about this particular tool for increasing adaptive capacity and additional information would be needed about potential consequences for agricultural lands*
 - a. **Survey Comments**
 - i. This is critically important. TDRs have had lots of conversation but not too much done about them. We ought to get moving on it. Dave Edgell is the state expert.
- 8. ****Develop a dike and levee safety program similar to the Dam Safety Program (Coastal Defenses)** *Dams are different from dikes and levees, but dikes and levees can be inventoried for safety similar to how dams currently are, and mandates can be created to address dike and levee concerns.*
 - a. **Survey Comments**
 - i. The State should conduct feasibility studies on removal/replacement/upgrades/abandonment on all existing dikes and dams, with a priority on protecting natural resources, public safety, essential public infrastructure, and (maybe, if we can afford it, which is questionable) residential areas (NOT including beachfront or other luxury housing or second homes). A process of triage will need to be used, as funding will be insufficient to maintain/enhance all dikes (along with everything else the State will have to pay for): consider cost of repair/improvements vs. costs (including environmental and social costs) of abandonment or active removal.

- ii. Photos, a sketch or a footnote showing or explaining the differences of dams, dikes and levees would be helpful. Some of your readers (including this one) may not appreciate the differences.

9. Designate Shoreline Zones for Adaptation Action (Industrial) *Shoreline protection and restoration projects require federal, state and sometimes local permits. Hardening of shorelines (Protection) is generally discouraged by state policies, but may be the most appropriate adaptation response in industrial areas. Planning for and designating areas where hardening will be allowable v. where hardening would be discouraged will provide certainty for permit applicants and may streamline the permitting process. Incorporate these designations into appropriate Federal, state and local permitting processes*

a. Survey Comments

- i. o Identify one or more vulnerability zones based on updated floodplain mapping and the most advanced climate change (including storm surge) predictions (reevaluate regularly). Don't subsidize flood insurance in those areas. o Prohibit issuance of building permits, at least for commercial or industrial facilities, in areas that will be inundated or frequently flooded (except for SLR mitigation or urgent environmental or social welfare reasons). o Adopt structure setback requirements so that new buildings would be built out of harm's way. o Allow for elevation of buildings (both new and existing) to raise them to levels where they would not be expected to be inundated. Options include (a) building on pilings to allow wetlands to migrate inland, or (b) surrounding structures with dikes (NOT to be allowed in areas needed for wetland migration and NOT to be maintained at public expense). This will likely involve substantial changes to building codes. o Allow for rolling conservation easements to facilitate wetland migration and coastal protection. o In critical shoreline areas, consider eminent domain as a means of acquiring land for buffers or wetland migration
- ii. Wouldn't hurt.
- iii. How identify allowable areas?

b. DCP Comments

- i. This could be combined with the recommendation for Statewide Retreat Plan
- ii. Criteria for designation would have to be developed based on best available information/peer reviewed literature and in collaboration with affected stakeholders

10. Understand need for protection between bayshore communities. (Coastal Defenses) *The total investment and return on investment is more than the sum of the community, greenways and other passive uses. Collect and monetize this data to understand if there is an economic boom in these areas and if there is better justification for the need for protection between these bay communities. Did recent studies include tourism, day tourism and second homes?*

a. Survey Comments

- i. does it mean evaluate?
- ii. I thought the Bay Beach Work Group settles this question from an economic and feasibility standpoint.

iii. What does this mean exactly?

- 11. **Prioritize planning for unincorporated towns (Water & Wastewater)** *Unincorporated towns on the Bay Coast are most susceptible to sea level rise and have the least capacity to adapt. Planning efforts should prioritize these areas.*

a. Survey Comments

- i. It would help mightily if each county had proper flood plain regulations with limited waiver possibilities.
- ii. Investigate the creation of special taxation districts, authorities, insurance funds, bond funds, or cooperatives to capitalize a revolving loan fund for adaptation/mitigation/retreat of individual facilities, and to cover public costs related to adaptation/mitigation/retreat of private facilities. Only those who contribute would be eligible to receive assistance. Assistance funding should favor those who take action sooner rather than later and should be evaluated on a social need basis.

- 12. Develop comprehensive wetlands restoration strategy (Land Preservation & habitat)** *A comprehensive wetlands restoration strategy is necessary given the anticipated impacts from sea level rise. The strategy should include identification of uplands for preservation and acquisition to provide areas for marsh migration; enacting buffers to prohibit barriers to migration; wetland restoration techniques to allow wetlands to keep pace with sea level rise; cataloging of pertinent research needs; policy and regulatory changes; and an outreach strategy. Specific ideas mentioned included: re-evaluating phragmites control techniques, beneficial re-use of sediment (including making this a priority during permit review of dredging projects), rolling buffers and easements, and expanding protection of tidal wetlands to include migration areas.*

a. Survey Comments

- i. none

- 13. Re-evaluate management strategy of existing coastal impoundments (Land Preservation & Habitat)** *Current management of impoundments may be unsustainable in light of sea level rise. Future management strategies should consider incorporating beneficial re-use of dredge disposal sediments to build up elevation, and possibly adjusting locations of impoundments after considering the landscape scale and resource needs. These types of changes will require outreach to communities.*

a. Survey Comments

- i. Easier said than done, but it would certainly help.
- ii. Currently being completed

- 14. Evaluate benefits/risks of allowing private impoundments (Land Preservation & habitat)** *There may be interest from private citizens or waterfowl hunting enthusiasts to create impounded wetlands on privately owned land. This practice is currently not allowed, but given the vulnerabilities identified to the state's impoundments, providing similar alternatives at a smaller scale can provide beneficial habitat if impoundments are properly managed. An endowment should be required for funding any future maintenance. Automatic tide gates could aid in ensuring proper management. Conservation easements would provide permanent protections*

and direct management practices. Impacts to local hydrology, mosquito control, flooding and drainage issues and potential liabilities should be evaluated.

a. Survey Comments

- i. Also terribly important. Then after the evaluation is done the state must speak with one voice. These folks in bayshore communities hear all different concepts from different state people.
- ii. I thought private impoundments are already allowed? Enlisting resourceful private interests into helping develop solutions like this will be good for political support

15. Develop a Framework for decision making regarding land protection and restoration strategies based on habitat vulnerability, migration potential and relative importance in the regional landscape, historical significance or other key factors. (Land Preservation and Habitat) *In order to prioritize land acquisition and protection strategies in light of sea level rise impacts, a decision tree, process model, cost/benefit analysis, or similar tool is needed. The U.S. Geological Survey is developing a computer model to prioritize habitat types for the northeast region. Upon completion, this model may assist in determining priority needs that consider a broader, regional context. This recommendation is important for protection of habitats of conservation concern, Nature Preserves, wetlands, protected lands, and other key natural resources identified in the vulnerability assessment. Land acquisition should be aggressively targeted for the highly ranked habitat types. The open space council should be advised. An executive order may be a mechanism to direct state agencies to consider sea level rise in land acquisition and to designate necessary funding.*

a. Survey Comments

- i. Work is underway at least for part of this
- ii. The selected adaptation/mitigation/retreat strategies should provide for clearing land (or elevating structures) for buffer zones into which wetlands could migrate as SLR occurs, or for building up low-lying areas with, e.g., clean (!) dredge spoils, particularly in areas where Living Shorelines are feasible and could help wetlands adapt as sea level rises.
- iii. Good idea but could get killed if it gets too complicated/bureaucratic

16. Develop means to evaluate Nature Preserves to determine response. (Land and habitat) *The states 29 nature preserves represent a variety of habitat types and species at risk and many of the preserves are located in areas vulnerable to sea level rise. In order to determine the best course of action to respond to the threat of rising waters, a decision tree, process model, cost/benefit analysis or similar tool is needed to evaluate each preserve to determine whether to protect it, accommodate the rising water and associated impacts, or allow retreat. The U.S. Geological Survey is developing a computer model to prioritize habitat types for the northeast region. Upon completion, this model may assist in determining priority needs that consider a broader, regional context. Other factors, such as level of public use or revenue generated, may require consideration in addition to the habitat value of each preserve. Additional funding mechanisms such as tourism revenue, bond bill, Delaware Bayshore Initiative, the Open Space Program and county funding sources, will be necessary to implement responses identified.*

a. Survey Comments

- i. printout was missing something on this so I couldn't full understand the strategy!
- ii. Not clear.
- iii. Just nature preserves? Might be an overlap here with other recommendations.
- iv. Identify ecological services provided to the public by these resources and place rational economic values on them so they can be considered on an equal basis with lands generating PRIVATE wealth.

Increase Public Awareness of Sea Level Rise through Education, Outreach and Marketing

Each focus group discussed the need for educating the public about sea level rise as a way to assist in gaining public support for adaptation measures that were discussed as well as a way for making better decisions overall. Adapting to sea level rise may initially concern many people and people may not fully understand the long-term implications of sea level rise. Making a consolidated, statewide effort to inform the public can better address sea level adaptation measures that are needed to address many, if not all, of the resources addressed in the vulnerability assessment.

- 1. **Develop a Comprehensive Outreach Strategy, Educate public about sea level rise (Land Preservation and Habitat, Transportation)** *From Land Preservation and Habitat: A comprehensive outreach strategy should broaden the message to beyond sea level rise to include water quality benefits and coastal hazard and flood protection benefits of adaptation actions. This would engage more agencies and funding sources. It's important to manage expectations as resource losses are inevitable, and to educate residents on beach replenishment benefits to the bay front system. From Transportation: Educate both residents and non-residents, including seasonal residents and tourists, about sea level rise and how planning for the long-term is mitigating problems today. Public support would help integrate sea level rise in long-term management plans, acceptance of the management decisions made, and possibly influence legislative decision making.*

a. Survey comments

- i. should be broader to include storm surge and land erosion / recedance
 - ii. Good luck! We can't even educate the public about evolution effectively. Can global heating be explained at a 4th grade level? Because that is what is necessary.
- 2. **Education and Outreach for impacted communities and citizens (Land Use)** *In order to make decisions about their homes and businesses, citizens must have access to up-to-date information and know where to go for resources. Information they may need includes: differences between long-term and short-term adaptation scenarios and resources; the*

combination of risk factors that exist together (drainage and stormwater, coastal storms and sea level), changes occurring in the insurance industry and insurance availability.

a. Survey Comments

- i. Really a result of 1
- ii. The State could serve as a clearinghouse for research and information on adaptation/mitigation/retreat strategies.

- 3. **Signs warning of sea level rise (Transportation)** *Create and erect signs in areas that are already being affected by sea level rise, as well as in areas that may experience the effects of sea level rise in the near future, to help make sea level rise a reality for many people. Putting signs along roads that are regularly flooded at high tide and on, or near, lands that are being, or are going to be, flooded by sea level rise will help warn and educate people who are in that area. Signs would be similar to those farmers put up warning local residents of their farming activities.*

a. Survey Comments

- i. Put warnings on Google Maps!
- ii. 3 or 4 100-year weather events in 2 years aren't enough?

- 4. Require real estate disclosures for properties in vulnerable areas, providing a means for potential homebuyers to understand their risks to sea level rise (Wastewater, Land Use)** *From Land Use: Sea level rise information must be made easily available and understandable to citizens, local governments and others. Several types of options to improve data availability were discussed including: creating an adaptation clearinghouse which would be a one-stop shop for those wanting data and information – could include an on-line GIS. From Transportation: Provide information about other sea level rise programs and initiatives that may have been successful and/or well received both politically and publicly in other states. From Industrial: There is a need for industries to better understand the risks of sea level rise so they can plan, but they also they need to be able to communicate long term v. short term risk to the bankers that loan them money. Link Sea Level Rise to hazard preparedness. Direct marketing and outreach to financiers may be helpful as well. Marketing and outreach will also be necessary for the permitting process.*

a. Survey Results

- i. I agree in concept; however, this may cause additional issues with an already distressed housing market. I would be interested in knowing how Bill Lucks thinks this will impact the purchase of homes in the bayshore community and other vulnerable areas.
- ii. People should be investigating this on their own before buying property. Caveat emptor.

- 5. **Improve data availability to the public (and others), including information about success stories as well as marketing and education (Land Use, Transportation, Industrial)** *From Wastewater: Disclosure of “unseen” conditions is common place in real estate transactions. Having a sea level rise Disclosure statement for properties in potential inundation areas would educate buyers on the future risk associated with their investment. From Land Use:*

Create a way in which new homeowners have access to information about sea level rise and can utilize it in their decision-making processes. The Newark Model was discussed. Newark requires that all homebuyers meet with a public official to review their homesite, potential future plans that could impact surrounding lands, floodplains etc.

a. Survey Results

- i. The State could serve as a clearinghouse for research and information on adaptation/mitigation/retreat strategies.

6. Targeted outreach to water and wastewater operators and water utilities

(Wastewater) Untapped opportunities exist to reach out to water and wastewater professionals. Annual conferences of water associations (Delaware Rural Water Association, Delaware Onsite Wastewater Recycling Association, etc.) are key venues for disseminating information on sea level rise and engaging stakeholders and experts in planning for impacts.

a. Survey Comments

- i. Partner with EPA Climate Ready Utilities program?
- ii. bullet under #1
- iii. I'm not sure how they are any different than so many other owners of public infrastructure.

Expand funding opportunities for adaptation planning and implementation projects:

1. ****Modify the Hotel Accommodations Tax to increase funds (Coastal Defenses, Land Preservation and Habitat, Industrial)** *From Coastal Defenses: The Hotel Accommodations Tax should include short term rentals, but exclude military and university/college rentals. There are more hotel rooms in New Castle County which bring in approximately 52% of the funding from this tax, 38% comes from hotel rooms in Sussex County, and about 14% from Kent County. A business license would address enforcement issues associated with an increased hotel accommodation tax that would include short term rentals and would bring in additional revenue from license and penalty fees that could additionally be used for work in coastal areas. Only 1% of the money collected through this tax goes to sand replenishment projects in coastal areas. There needs to be a better understanding of where the other percentage of the money in the general fund is being used for and figure out if it can be better allocated to coastal needs.* *From Land Preservation and Habitat: Funding is identified as an important factor to collecting important data that will improve risk assessments, allow for mitigation projects if needed, and facilitate the implementation of innovative adaptive responses. Currently, this tax applies to hotel stays only. Taxing other rental properties may provide a dedicated funding source for sea level rise response actions.* *From Industrial: Funding is identified as an important factor to*

collecting important data that will improve risk assessments, allow for mitigation projects if needed, and facilitate the implementation of innovative adaptive responses. Currently, money generated from a lodging tax goes towards beach replenishment programs. In terms of the lodging tax, a bay beach can receive this funding only if it is part of a sand replenishment program. Perhaps a funding stream should be developed for sea level rise.

a. Survey Comments

- i. There would be a lot of opposition to this, but it's worth looking at. A study should include levels of such taxation in surrounding states
- ii. The feasibility of this is currently being researched by DNREC, DEDO and Finance.
- iii. maybe apply to targeted or specific locations--not the entire state
- iv. Tax the tourists! Always popular with the locals...
- v. The affected interests need to become aware that a proposal is being considered to "raise their taxes". Could be very controversial

- 2. Revise Strategies for State Spending to allow State Revolving Fund (SRF) and other public funding to be allocated for projects in Level 4 areas. Create Revolving Loan Fund for adaptation responses (Water and Wastewater, Land Use)** *From Water and Wastewater: At present the SRF cannot be used to fund projects in Level 4 areas without a demonstrated need to protect public health. This creates a financial barrier to providing community systems or central sewer to residents and businesses with individual septic systems that may be vulnerable to sea level rise. As septic systems become compromised, allowing centralized sewer may prolong the need to relocate farther inland. There are mechanisms in place to prohibit encouraging future growth, such as restrictions on linking into pump stations in Level 4 areas; however, these restrictions must be enforced at the county level. From Land Use: There is not currently a designated source of funding for public or private sea level rise adaptation projects. A revolving fund would provide low interest loans for high priority projects.*

a. Survey Comments

- i. State government will have its hands full financially in adapting/retreating public infrastructure sites such as the Port, roads, and hospitals. Further, DNREC will be saddled with the cost of remediating or securing orphan HSCA and Brownfield sites. And the State is likely to face demands from residential property owners for financial assistance. Therefore, State government should NOT undertake to subsidize active privately owned industrial or commercial sites. If assistance is given to owners of residential properties, it should be in the form of loans rather than grants, except in provable cases of significant economic hardship. Further, the State should not subsidize any behavior that increases or fails to take into account SLR considerations for private sites subject to SLR effects, or that would tend to shift private cost burdens onto the public budget.
- ii. I really feel the emphasis has to be placed on projects. Show where the money is actually going and what is being achieved over time. I think the money should

be targeted for Acquisitions, elevations, flood proofing and infrastructure protection projects.

- iii. The whole "Level 4" designation needs to be reviewed for its enforceability
- iv. Development projects in Level 4 areas?? What kind of projects exactly?
- v. looks like this one is really 2 unique suggestions
- vi. "Projects" is pretty open-ended. Doesn't sound good but wouldn't rule it out totally. Level 4 areas that are threatened should probably just be abandoned. Building sewer systems there would just increase investments and the concomitant reluctance to abandon property likely to be inundated.
- vii. those "certain criteria" are extremely conservative and seem to be applied arbitrarily. The Clean Water Advisory Council should be empowered to decide if it makes sense to direct funds to certain areas, and take it out of the hands of apparently biased agency technicians

b. DCP Suggestions

- i. Separate these into two recommendations.
- ii. Keep the suggestion for use of SRF Funds for adaptation responses.
- iii. Delete recommendation to allow SRF Funds in Level 4 as it can (and often is) already used when a public health need is demonstrated.

3. Consider use of Regional Greenhouse Gas Initiative (RGGI) funds for adaptation actions in industrial areas (Industrial)

Funding is identified as an important factor to collecting data that will improve risk assessments, allow for mitigation projects if needed, and facilitate the implementation of innovative adaptive responses. RGGI funding was one pot of money identified as a potential funding resource

a. Survey Comments

- i. RGGI is a declining revenue source and I believe close to being extended to its max capacity.
- ii. Not just industry-should be in all area
- iii. Note: For RGGI to be a useful funding source for coastal programs, it needs to be strengthened (caps lowered) to increase the market value of CO2 emission allowances

4. Evaluate the federal Farm Bill or farmland conservation programs to identify financial compensation to encourage wetland migration on farmlands adjacent to wet areas.

(Land Preservation and Habitat) *Programs exist, such as the USDA's Wetland Reserve Program which provides incentives to enhance wetlands in marginally-productive agricultural lands. These programs may be underutilized in the state or other incentives may be available to aid in the protection of lands conducive to allowing wetland migration.*

- a. DCP Recommendation – Keep, but rephrase to “Coordinate with” Or “Encourage” Feds to....
- 5. **Inventory existing funding, coordination, regulations and policy for barriers and opportunities (Industrial)** *Developing a list of these mechanisms will provide a starting place to assess coordination and understand where improvements can be made. Some of these existing tools, funding mechanisms and regulations have already been compiled. Incorporated into this inventory should be an understanding of private sector contingency plans that incorporate sea level rise.*
 - a. This one duplicates recommendation above. Delete.
- 6. **Possible, broad funding sources: Total Maximum Daily Load funds, Cancer Settlement Funds, Hazardous Substance Cleanup Act funding, MAP-21, New Energy Bill (?) (Industrial, Transportation)** *From Industrial: Funding is identified as an important factor to collecting important data that will improve risk assessments, allow for mitigation projects if needed, and facilitate the implementation of innovative adaptive responses. Total maximum daily loads are set for certain water bodies to set a limit on the amount of pollutants that can enter a water body while still maintaining water quality standards. With the risk of industrial facilities adding to the contaminants, TMDL funding may be appropriate to put towards adaptive responses for industries. It was suggested that cancer settlement funds could be put towards funding adaptive measures if a case was made that toxins could be spread in groundwater. HSCA funds are generated through a tax on wholesale gas/petroleum products and are directed towards cleaning up hazardous waste sites. From Transportation: Sea level rise can be presented under MAP-21 as a safety and security issue. There is an existing energy bill that allows for money to be spent on sea level rise avoidance. This bill, and associated funds, could aid in retreat efforts.*
 - a. Survey Comments
 - i. Use of tobacco funds would not be appropriate; HSCA funds are set to sunset and are already over extended
 - ii. It seems a stretch to try to tap some of these sources; others will also want their funds
 - b. DCP Comments
 - i. Sounds like use of the state funds may not be the best way to go. Map-21 and Energy Bill are federal
 - ii. Delete and pursue sources of funding that are more realistic
- 7. ****Increase funding availability for the Port of Wilmington (Industrial)** *All funds for operations and projects for the Port of Wilmington come from the bond bill. The Port may need to expand where they can get funds for adaptation to keep them viable. Borrowing money is not a viable option as they will still have to return it to make improvements.*
 - a. Survey Comments
 - i. I just don't know much about this!

- ii. Extremely important. The Port is closed to visitors so public awareness of the issue is often based on speculation.
- iii. or alternative investors
- iv. Public infrastructure incl. Port of Wilmington: Begin developing adaptation/mitigation/retreat strategies NOW. Estimate the cost of various options and undertake a planning process designed to implement those strategies on a planned, rational basis with due consideration for environmental, social, and financial impacts. Where feasible, develop funding mechanisms based primarily on user fees rather than State appropriations.
- v. Privatization incentives should be included
- vi. Why?

Improve the Availability & Robustness of Sea Level Rise Data Sets:

All six focus groups discussed and made recommendations for improving the amount of data and information available for making decisions about adapting to sea level rise. Information useful for making decisions now is limited primarily to the statewide bathtub inundation model (DNREC, 2012 and available for viewing online <http://de.gov/slrmap>). While this model is useful for predicting long-term inundation from sea level rise on a large geographic scale, it does not provide a level of detail that would be required for site-specific or local decisions about adaptation, nor does it provide any information about groundwater or salinity impacts.

1. ****Conduct a risk assessment for Delaware's system of dikes & levees (Coastal Defenses)** *Do an inventory of the dikes and levees in the state to find out which ones are most at risk. Evaluate which ones are more at risk from sea level rise and which ones are more at risk from storm water and evaluate the risk condition for each specific dike and conduct a risk analysis and evaluate if there is an escalating risk at the sea level rise scenarios from the vulnerability assessment.*
 - a. **Survey comment**
 - i. Wasnt this done recently?
 - ii. The State should conduct feasibility studies on removal/replacement/ upgrades/abandonment on all existing dikes and dams, with a priority on protecting natural resources, essential public infrastructure, and (maybe, if we can afford it, which is questionable) residential areas (not including beachfront or other luxury housing). A process of triage will need to be used, as funding likely will be insufficient to maintain/enhance all dikes (along with everything else the State will have to pay for): consider cost of repair/improvements vs. costs (including environmental and social costs) of abandonment or active removal.
 - iii. Is this a repeat of a prior recommendation?
2. ****Develop and maintain a comprehensive database that contains the location and condition of all wastewater infrastructure (Water & Wastewater)** *The Vulnerability Assessment analyzed public wastewater facilities and pumping stations. Data layers on private or community systems,*

pumping stations and pipelines are not available in a consolidated format. This information needs to be gathered from various sources and entered into a comprehensive database and routinely updated to more accurately plan for sea level rise impacts to wastewater systems; and to identify opportunities to integrate services in vulnerable areas to systems that may be more reliable over time. The database should include a conditions assessment of the facility in order to plan for anticipated maintenance and upgrades.

a. Survey Comments

- i. May be security concerns with drinking water infrastructure
- ii. Useful even without SLR
- iii. This is critical. It is a great data vulnerability right now.

- 3. **Identify Data Needs to Plan Transportation Investments (Transportation)** *Identify roads and bridges that are located in areas that are expected to have flooding issues as illustrated through the inundation models in the vulnerability assessment. Prioritize these transportation routes based on: system performance, age and condition, lifespan, origin and destination, replacement schedule, adjoining land use (both present and future), and identify the choke points.*

a. Survey Comments

- i. Data needs for determining SLR mitigation investments? There are mechanisms in place to prioritize projects already that will be adapted.

- 4. **Model Potential Stormwater Inundation Problems in highly vulnerable areas (Coastal Defenses)** *New Castle County currently has issues with flooding in poorer areas of town where stormwater is the primary source of inundation. Tide gates that have been historically used no longer are effective since they are being kept closed due to sea level rise, leaving stormwater with nowhere to go.*

a. Survey Comments

- i. What are "highly vulnerable areas"? Areas that are particularly vulnerable, or areas with people that are particularly vulnerable? Both? Describe
- ii. Don't forget storm surge.
- iii. Will need better models for micro analyses.

- 5. Develop a model that will predict changes to salinity in surface water that may occur under differing sea level rise scenarios (Industrial, Land Preservation & Habitat)** *From Industrial: Improved understanding of sea level rise impacts to the extent of salt water in the Delaware River is necessary to better assess risk. Saltwater contamination into fresh surface waters could create corrosion problems at facilities. From Land Preservation & Habitat: Understanding changes in salinity in conjunction with increases in water levels is vital. Modeling can provide information necessary to better anticipate impacts to natural systems. This could be done on a smaller watershed scale using nested models. Climate change uncertainties and precipitation inputs are key variables. If possible, evaluate scenarios for increasing freshwater inputs to offset upriver movement of the salt line.*

a. Survey Comments

- i. Important, but very complicated (and likely expensive) - will need to be strategic. A more practical approach may be to identify thresholds (for people,

fish/shellfish, habitat) and making sure monitoring is in place to allow us to determine if/when we are approaching them

ii. This is more R & D than is needed in the short term

- 6. Develop a statewide groundwater model (Water & Wastewater, Industrial)** *From Water & Wastewater: A general, screening-level groundwater computer model can provide information on how sensitive groundwater movements and water table levels may be to sea level rise. This information can then be used to assess where a finer scale model would be beneficial. From Industrial: Salt water can be very problematic for industrial facilities, due to corrosion, intake issues etc. Therefore there is a need to know the extent to which salt water will inundate industrial lands, both on the surface as well as in the ground water as a result of sea level rise and storm surges. Some of these data may be available through Delaware River Basin Commission. This will help improve the understanding of which industrial resources are at risk. Assessment may need to occur on a site specific basis. Improved understanding of sea level rise impacts to the water table is necessary to better assess risk, particularly to areas holding contaminated materials on site. Assessment may need to occur on a site specific basis.*

a. Survey Comments

- i. Useful even without SLR.
- ii. A limit on the scope and cost must be established or this could take on a life of its own
- iii. Same comments as above (5)

- 7. Create a Research and Policy Center at the University of Delaware that would focus on applied research for sea level rise and adaptation (Industrial)** *There are a variety of data gaps that could be filled to improve our understanding of sea level rise risks, and would therefore improve planning efforts. The group thought it may be helpful to incentivize university researchers to address these topics. Clear statements of research needs may improve academic's abilities to apply for and win grant money to take on such projects.*

a. Survey Comments

- i. May or may not be at UD - focus should be regional and there are a number of places already doing work on this (ideally would be a collaboration of multiple institutions)
- ii. evaluate not create
- iii. How would this be funded? Public funding should focus on meeting PUBLIC needs. But somebody should do it, and UD is probably as good as anybody... though why not make it a consortium of all DE colleges rather than playing favorites?
- iv. Research is already being done through the T2 Center at the UD. See Sue McNeil.
- v. other climate change impacts too
- vi. Again, can we do this?

- 8. Improve monitoring of current sea level conditions and improve predictions for timing of inundation (Industrial, Land Use)** *From Industrial: Current sea level trends are derived from two NOAA tide gauges, one at Lewes and one at Reedy Point. There may be a need to expand the*

number of monitoring stations. The rate of sea level rise is not static, so continual monitoring is important to ensure model projections incorporate most recent rates of change. Improved data will help define the potential risk on a finer scale. *From Industrial: Get better resolution as to the timing of impacts – monitor sea levels, communicate any changes. Fuzzy numbers doesn't help industries get the funding assurance they need to keep operational or make projects happen. Additionally, better plans can be made with a better understanding of the risk. From Land Use: The Statewide vulnerability assessment does not provide the level of information necessary to make site specific adaptation decisions, and does not currently provide a useable time-scale for potential impacts. Improving this data would require increased level of monitoring of water levels and landscape changes, and would require modeling of particularly vulnerable locations with more sophisticated models that would predict landform changes through time (in addition to the bathtub model)*

a. Survey Comments

- i. Absolutely - wetland condition monitoring needs to be part of this - have a framework for but currently being supported by competitive grants - need sustainable funding! Have emergency response systems/networks for communicating on spills - could use similar for storms/flooding?
- ii. Need more stations! But there has been pressure to de-fund them.
- iii. Scope and budget limits need to be set

9. Increase understanding of the regional implications of loss of industrial areas in coastal Delaware (Industrial)

Reduction in capacity at power generating facilities and ports will have regional implications for the electrical grid and goods and services. In order for businesses to make wise decisions about future investments in their coastal industrial properties, additional information will be needed about impacts to other facilities throughout the region.

a. Survey Comments

- i. I don't know much about this!
- ii. SLR adaptation provides a tremendous opportunity to pour billions of dollars of public funds into an ever-expanding rathole. The State needs to evaluate carefully what it can and should afford and what it cannot or should not. Private demands for public funds should be viewed with extreme skepticism.

10. Improve understanding of impacts to adjacent properties from adaptation actions (Industrial)

Some adaptive measures taken to mitigate the impacts of sea level rise may have unforeseen impacts elsewhere. For example, if an impoundment is put in place to protect a facility, it will be important to understand what happens to the displaced water. Understanding the impacts of various adaptive measures will help guide adaptive response plans.

a. Survey Comments

- i. Some of this is obvious or at least already understood. Read any manual on Living Shorelines, for example.

11. Develop sea level models that incorporate storm surge impacts (Industrial)
Currently the sea level rise vulnerability assessment is based on a bathtub model, where the extent of inundation is estimated based on estimated mean high tide and elevation. Storm surge may compound the

impacts of sea level rise by pushing water further inland than it might go based on mean high tide alone. Storms also have the potential to occur sooner than the impacts of sea level rise, which are projected to take decades in many areas. A storm surge model that takes into account future sea levels may help provide a tool for industries to better plan for inundation impacts.

a. Survey Comments

- i. absolutely!
- ii. Efforts are underway
- iii. Absolutely essential! Our past and current efforts are of very limited use without this
- iv. Scope and budget limits need to be set

12. Foster pilot projects that demonstrate the effectiveness of best management practices for management of agricultural lands affected by sea level rise (Land Preservation & Habitat) *Pilot projects to demonstrate, or study the effectiveness of, Best Management Practices will be useful in providing technical assistance to land managers to adapt to sea level rise.*

a. Survey Comments

- i. How are the berms working, for example? Is this cost effective?
- ii. There's only so much you can do.

13. **Identify and Preserve areas for potential wetland migration (Land Preservation and Habitat)

As coastal wetlands become permanently inundated, it is vital to facilitate the landward migration of these habitats to maintain their valuable functions. Using available GIS data layers, identify lands adjacent to wetlands which have the potential to accommodate future marsh migration. Develop criteria to prioritize lands for acquisition or permanent conservation easement. For instance, areas that are undeveloped or lack barriers such as major transportation routes or other infrastructure would more easily accommodate wetland migration. Means to prohibit structures or obstructions in areas identified as suitable for potential migration should be evaluated.

a. Survey Comments

- i. Need more research on how wetlands migrate, thresholds
- ii. Absolutely agree.

14. ** Encourage Federal agencies to integrate Sea Level Rise Planning into their models (Coastal

Defenses) *THE NFIP and FEMA do not currently include sea level rise in their models, though there is new legislation that was recently passed. Federal agencies currently do not have any adaptive plans, rules or models; they use models that are based on historic data. Sea level rise equations need to be included in federal modeling to address development in flood prone areas.*

a. Survey Comments

- i. think they're already doing more than we are.
- ii. A limitation I have with the Mitigation programs I manage is that projects must be cost effective. Proving cost effectiveness requires me to use existing flood studies with no provisions for Sea-level rise.

Provide technical assistance to partners for assessing vulnerability and choosing adaption strategies

1. ****Ensure consistent decision-making between state agencies (Land Use)***Many state agencies have a role in planning for future growth needs including DelDOT, OSPC, DEMA and DNREC. In order to ensure consistent decision-making with regard to areas vulnerable to sea level rise, each agency must have access to and use the same data and planning scenarios. Silos must be broken down. Each must develop plans for vulnerable areas in coordination with each other. This could require an Executive Order.*
 - a. **Survey Comments**
 - i. Need executive order; primacy of needs/action must be determined as well.
 - ii. I believe this could be part of the EO.
 - iii. that would be a first!
2. ****Create a Coordinated Effort to Provide Technical Assistance to Local Governments, including funding (Land Use)***Municipal and county governments may not currently have the staff resources, technical capability or funding to plan for and adapt to sea level rise. There is no one coordinated entity that is providing coastal hazard and sea level rise assistance to municipal governments. Delaware Coastal Programs provides technical assistance and grant funding once a year. Delaware Sea Grant provides technical assistance through its Sustainable Communities Program. Office of State Planning and Coordination provides technical assistance to communities conducting Comprehensive Development Plan revisions, as does that the Institute for Public Administration. A coordinated effort by these (and other) entities could result in a consistency between local jurisdictions and ensure that all municipal governments wishing to plan for coastal hazards and sea level rise can obtain the technical assistance they need.*
 - a. **Survey Comments**
 - i. Agree, but need to figure out how this would work and be supported
 - ii. info about funding but not the actual funds
 - iii. where will funds come from?
 - iv. I would say including funding opportunities-we shouldn't just throw money out there without a plan in place on where/when/how it will be spent
3. **Provide land managers and farmers with the information and Extension support necessary to manage lands in areas affected by sea level rise (Land Preservation and Habitat)***Technical assistance for land managers and agricultural producers is needed to disseminate information on salt water intrusion in irrigation wells, what plant species are salt tolerant, and best management practices (BMPs) for lands/wetlands in transition due to changes in water level or salinity. University extension agencies or other established program such as the Natural Resource Conservation Service could be modified to provide this service. An additional goal might be to foster pilot projects to demonstrate or study the effectiveness of BMPs.*
 - a. **Survey Comments**

- i. Also need to learn more about managing fisheries/shellfisheries, aquaculture with changing water conditions
- ii. This would be tricky. "Managing" lands could morph into a plan to preserve at all costs.
- iii. If land management support involves buying land, I disagree. If it is education outreach, I agree.
- iv. Agree. Addressed in comments above.

4. Provide Technical Assistance for Industrial and Port Facilities to incorporate sea level rise into investment plans and continuity of business plans (Industrial) *Facilities often have robust continuity plans where they address interdependencies, but no inventory of these plans has been conducted. Sea level rise could be incorporated into these plans to ensure facilities are resilient to the impacts of storm surge coupled with sea level rise.*

a. Survey Comments

- i. They have expertise, need funds.
- ii. State government will have its hands full financially in adapting/retreating public infrastructure sites such as the Port, roads, and hospitals. Further, DNREC will be saddled with the cost of remediating or securing orphan HSCA and Brownfield sites. And the State is likely to face demands from residential property owners for financial assistance. Therefore, State government should NOT undertake to subsidize active privately owned industrial or commercial sites. At the most, the State should serve as a clearinghouse for research and information on adaptation/mitigation/retreat strategies. Further, the State should not subsidize any behavior that increases or fails to take into account SLR considerations for private sites subject to SLR effects, or that would tend to shift private cost burdens onto the public budget.

5. Develop a Best Management Practice Manual for Adaptation in Delaware

(Transportation) *Base Best Management Practices on what other states have done which are successful. Other states that work on sea level rise can be considered a tool box for adaptation, including looking at other policies and recommendations that may have been successful in those states that could be used to help guide Delaware's sea level rise initiative.*

a. Survey Comments

- i. various iterations for different populations/agencies should be created

Increase understanding of cost of adapting v. non-action (economic benefits, socio-economic)

1. ****Secure adequate and permanent funding for the Delaware Bayshore Initiative; Conduct a cost benefit analysis through the Bayshore Initiative to justify use of funds (Land Preservation**

and Habitat, Coastal Defenses)*From Land Preservation and Habitat: The Delaware Bayshore Initiative is a major state and DNREC initiative without a dedicated funding source. From Coastal Defenses: Conduct a cost benefit analysis evaluating protection measures and return on investment from coastal sand projects and use the Initiative to protect areas with the most tourism, as well as areas that make Delaware unique, i.e., horseshoe people, birders, and hunters. Use information from UD's coastal economic analysis to understand the economic benefits of the coast to justify the need to address sea level rise. Use tourism information to justify the cost of adaptation.*

a. Survey Comments

- i. Agree, but need better monitoring data before this can really thoroughly be analyzed
- ii. You can make a CBA say whatever you want. And why the DBI? This is a somewhat limited program.

2. Form a Committee to Investigate Risk Portfolio Issues resulting from sea level rise

(Industrial)*To date, there has not been involvement in the Sea Level Rise Committee or Vulnerability Assessment from members of the financial community. Sea level rise scenarios may make investors less likely to make funding and/or insurance available to waterfront industries.*

a. Survey Comments

- i. What does this mean?
- ii. should be augmented to read, "...waterfront industries, businesses, developers and home owners."

3. **Abandon roads and redirect funding to recreation; funding options for retreat, coastal tax; identify and determine the feasibility of alternative funding mechanisms to offset costs of sea level rise adaptation responses (Land Preservation and Habitat, Transportation, Wastewater).*From Land Preservation and Habitat: Repeated maintenance of roads in areas increasingly flooded by the rising tides becomes cost-prohibitive. The state should consider abandoning roads in some areas where impact to residents and businesses are minimal. Budgeted maintenance costs could then be redirected to provide recreational opportunities or support recreational facilities. From Transportation: Implement a coastal tax, classify some roads as "coastal roads," implement traffic metering, change the current capacity through increased use of transit, reduce the level of service to some roads over time, and discourage future development. Designate roads in areas that are to be affected by sea level rise as coastal roads. Designating these roads would change the amount of maintenance required leading to possible abandonment of the road. For new roads, include some type of consideration for avoidance of areas based on regulation due to the likelihood for flooding and inundation in that area. Enact a coastal tax to be used to fund retreat options, discourage future coastal development and to fund road maintenance in coastal areas. From Wastewater: Coastal user charge for instance, or funding sources that foster water quality improvement projects such as*

Estuary Programs or funding that can be used to protect recharge areas. Regional or statewide impact fee? Regional to discourage locations, statewide because all will be paying these costs in some way

a. Survey Comments

- i. "Redirect funding" to ENVIRONMENTAL PROTECTION (esp. wetlands and aquatic habitats) and recreation.
- ii. DelDOT cannot support any redirection of Transportation Trust Fund dollars to non-transportation purposes. We do however agree with the several other points made about abandoning unmaintainable roads, developing public education programs, identifying new revenue sources, etc.
- iii. This needs much more work; very controversial ideas that could engender great opposition to any other SLR work

- 4. Revise Strategies for State Spending to allow State Revolving Fund (SRF) and other public funding to be allocated for projects in Level 4 areas (Wastewater)***At present the SRF cannot be used to fund projects in Level 4 areas without a demonstrated need to protect public health. This creates a financial barrier to providing community systems or central sewer to residents and businesses with individual septic systems that may be vulnerable to sea level rise. As septic systems become compromised, allowing centralized sewer may prolong the need to relocate farther inland. There are mechanisms in place to prohibit encouraging future growth, such as restrictions on linking into pump stations in Level 4 areas; However, these restrictions must be enforced at the county level. This was a recommendation discussed during the focus group meeting. In contrast however, SRF can apparently be used in level 4 areas IF certain criteria are met. For instance- as inserted above-if there is a demonstrated need to protect public health. Additional thoughts here from the group would be appreciated.*

a. REPEAT. STRIKE FROM THIS SECTION

Additional Recommendations Received After the 11/2/12 SLRAC Meeting:

- 1. Publicize the benefits of participation in the FEMA Community Ratings System (added by SLRAC Committee member).** The Community Ratings System is a FEMA program that encourages municipalities to develop floodplain ordinances and offers discounts. The communities of Bethany Beach, Delaware City, Dewey Beach, Fenwick Island, Lewes, New Castle, Newark, Rehoboth Beach, Seaford and South Bethany have implemented ordinances that meet the criteria for flood insurance discounts between 5 and 15 percent.
 - a. Survey Responses**
 - i. Splendid recommendation.
 - ii. Start by telling us.
 - iii. Several Delaware communities don't even have a FEMA-acceptable set of floodplain regulations, so those communities are not eligible for flood plain

insurance backed by FEMA. Since all municipalities and counties are currently required to update and present their comprehensive plans every 10 years to the Office of State Planning Coordination (OSPC), we already have the vehicle for such oversight.

iv.

b. DCP Recommendation

i. Incorporate into recommendation about joining forces for technical assistance

2. **Develop a database of costs of adaptation options for use by decision-makers and the public (added by SLRAC Committee member).** Such a database should have example costs of: raising a building, beach replenishment, abandoning buildings, elevating roadways, building hardened shorelines, raising and repairing dikes, and living shorelines (soft shoreline restoration like grass planting).
 - a. Survey Comments
 - i. Could give example costs, but putting a specific \$ amount on is very difficult (site specific, not a lot of experience with some adaptation)
 - ii. Cost estimating is very site specific. Such a database would have limited utility.
3. **Improve the accuracy of Delaware's elevation benchmark network (added by DCP)** Delaware's network of benchmarks used for elevation surveys are currently inadequate due to lack of coverage in key coastal areas and problems with accuracy of existing benchmarks. Existing benchmarks should be re-surveyed and additional benchmarks created. This is necessary to ensure that adaptation projects in coastal areas are designed and constructed with accurate elevation data. (DCP is currently working with partners to implement this project)
 - a. Survey Comments
 - i. Cost?
4. **Continue and expand studies regarding sediment accretion rates and susceptibility of wetlands to sea level rise (added by DCP).** The state, University of Delaware and the National Estuary Programs have been working together to study and monitor sediment accretion rates and plant composition in Delaware's marshes in order to better understand survivability of certain marshes to inundation from sea level rise. Expanding this work to additional targeted locations across the state will provide a better data set from which to base land acquisition, restoration and retreat decisions.
5. **Add additional tidal observation stations in Delaware (added by DCP).** Variations in tidal levels in the Delaware Bay can be highly localized. The number and location of existing tidal stations in Delaware are inadequate to understand place-specific tidal conditions. A report entitled "A Data GAP Analysis and Inland Inundation Survey for the Delaware Coastline (Leathers et al, 2010) recommended additional stations in the vicinity of Slaughter Beach, Longneck, New Castle, Woodland Beach and Port Mahon.
6. **Install inland inundation water level monitoring sites (added by DCP).** To better understand how tide levels on the coast equate to inland flooding and inundation, a series of inland water level monitoring stations is necessary. Such stations can help with understanding of extent and frequency of storm flooding in the short term while providing data and information useful for planning adaptation responses.

7. **Conduct research to better understand human response to sea level rise and adaptation (added by DCP).** People are the core of any adaptation decision. Currently, there are few studies about coastal residents' opinions of adaptation actions, thresholds for action or likely emotional responses to flooding and inundation issues. A better understanding of coastal residents attitudes, perceptions and motivations could be very helpful in working with communities to choose adaptation options.
 - a. **Survey Comments**
 - i. All truth passes through three stages: First, it is ridiculed; Second, it is violently opposed; and Third, it is accepted as self-evident. -- Arthur Schopenhauer (1788-1860)
 - ii. I think there is enough research out there-perhaps identifying existing research and utilizing it would be more effective

Additional Recommendations Received from SLRAC members after the Survey closed

8. **Delaware children should learn about climate change and sea level rise in the public schools** – perhaps by including these subjects in the junior high or high school science curriculum standards.”
 - a. Note: UD Dean Nancy Targett is working with faculty at UD and MD universities with NSF funding to develop a junior high science curriculum for climate change.
9. **Designate an office in the state government to which citizens can turn to get the latest information on insurance – both private and public – for privately owned property and structures at risk from flood or storm damage along the coast and inland bays.**
 - a. Flood and storm insurance are changing as a result of increasing losses from extreme weather events like Hurricanes Katrina and Sandy. The federal government is running record deficits and is unlikely in the foreseeable future to be as generous in covering losses as in the past. Those who are considering purchasing property or building in risky areas near the coast should have a place to go for timely and accurate insurance information. The Delaware Office of the Insurance Commissioner seems like the logical choice
10. **Strive for fairness and social justice in the selection and funding of adaptation actions.**
 - a. Consider impacts to socially vulnerable communities; attempt to minimize human suffering from injury and property loss. Thus most of the resettlement money for those whose homes and businesses must be abandoned should go to those with the least resources to move or to adapt - or example to those with low incomes and little wealth rather than to those for whom a lost building is a second home. Increasing financial responsibility for sand replacement, road maintenance, and repair and replacement of property damaged because of coastal storms and sea level rise should be assumed by those who choose to live near the coast - especially those in communities with private beaches that are not accessible to the general public